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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/649,927

08/25/2003

Radovan Kovacevic

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04/26/2005

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EXAMINER

EVANS, GEOFFREY S

ART UNIT

PAPER NUMBER

1725

DATE MAILED: 04/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/649,927

Applicant(s)

KOVACEVIC ET AL.

Examiner

Geoffrey S. Evans

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 February 2005.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 20041112, 20050107.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

1. Please note in claim 2 there is no antecedent basis for "the infrared camera".
2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1,11,16 and 26 are rejected under 35 U.S.C. 102(e) as being anticipated by Fehrmann et al. in WO 03/07414 A1, filed 10 February 2003. Fehrmann et al. discloses a method for controlling the molten pool by imaging with a CCD camera (e.g. see page 5,line 27) to determine the temperature of the molten pool and temperature gradients. The temperature readings are proportionate to the size of the melt pool. This information is used to control the laser power (e.g. see page 10,lines 20-22). Fehrmann et al. further discloses using software tools for this control system (see page 10,last three lines) and accomplishing control of the laser based manufacturing process in real time (e.g. see page 10,lines 23-24).
4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1,6,8,9,10,11,14-16,24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arcella et al. in U.S. Patent No. 6,605,795 in view of Koch et al. in U.S. Patent No. 6,122,564 and either Kanamaru et al. in Japan Patent No. 2002-239,767 or Owaki et al. in Japan Patent No. 2001-287,064. Arcella et al. has method and apparatus for controlling the size of the molten pool in a laser based additive manufacturing process comprising imaging with an imaging device (element 90 which may be a CCD camera) and feedback control of the laser (see column 4, line 28). Arcella et al. does not disclose that the laser nozzle is coaxial with the imaging device, nor does Arcella et al. disclose adjusting in real time the laser power. Both Kanamura et al. (see paragraph 7) and Owaki et al. (see paragraph 13) individually teach using a camera in a coaxial position relative to the laser beam torch to use a compact design to measure the size or area of the melt pool. Koch et al. teaches controlling the laser power in a closed loop manner (see column 7, line 54 to column 8, line 3) to control the

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accumulative dimensions of the workpiece. It would have been obvious to adapt Arcella et al. in view of Koch et al., and either Kanamaru et al. or Owaki et al. to provide this to use a compact design for the nozzle, laser and camera assembly and to control the accumulative dimensions of the workpiece. Regarding claims 6 and 8, Koch et al. teaches a neutral density filter before the camera (see column 6, lines 3-6). It would have been obvious to adapt Arcella et al. in view of Koch et al., and either Kanamaru et al. or Owaki et al. to provide this to filter out interference.

7. Claims 2, 7, 17 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arcella et al. in view of Koch et al., and either Kanamaru et al. or Owaki et al. as applied to claims 1 and 16 above, and further in view of Jasper et al. in U.S. Patent No. 6,311,099. Jasper et al. teaches that the melt of the bath is easily detectable with as little interference as possible in the near infrared (820 nm to 1050 nm) using a CCD camera (see column 5, lines 3-21) by using filters. It would have been obvious to adapt Arcella et al. in view of Koch et al., Jasper et al. and either Kanamaru et al. or Owaki et al. to provide this to detect the geometry of the melt bath with as little interferences as possible.

8. Claims 3, 4, 18, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arcella et al. in view of Koch et al., Jasper et al. and either Kanamaru et al. or Owaki et al. as applied to claims 2 and 17 above, and further in view of Hu et al. in the article "Improving solid freeform fabrication by laser-based additive manufacturing". Hu et al. teaches using an IR CCD camera that has a frame rate of up to 800 frames per second (see figure 4 and the first column of page 1257). It would have been obvious to

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adapt Arcella et al. in view of Koch et al., Jasper et al., Hu et al. and either Kanamaru et al. or Owaki et al to provide this to acquire images for real time processing.

9. Claims 5-8,12,13,17,20,21,23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arcella et al. in view of Koch et al., and either Kanamaru et al. or Owaki et al. as applied to claim 1,11,16 above, and further in view of Hu et al. in the article "Improving solid freeform fabrication by laser-based additive manufacturing". Hu et al. teaches using an infrared camera with a high frame rate charge and an imaging resolution of 128x128 (see figure 4 and the first column of page 1257). It would have been obvious to adapt Arcella et al. in view of Koch et al., Hu et al. and either Kanamaru et al. or Owaki et al to provide this to quickly obtain acquire images of adequate resolution of the melt pool geometry.

10. Applicant's arguments filed 20 January 2005 have been fully considered but they are not persuasive. Fehrmann et al. in WO 03/07414 A1 measures the temperature and thermal gradient. Clearly, the areas that are above the melting point of the workpiece are molten and part of the molten pool. In view of the physical property of thermal conduction, when a high temperature is measured, the molten pool is larger than contrasted with a lower temperature. Regarding Koch et al. in U.S. Patent No. 6,122,564, this reference is not being relied upon to teach a laser nozzle coaxially aligned with the imaging device.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

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§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

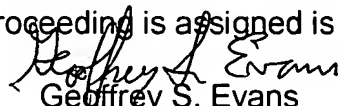
12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kluft in U.S. Patent No. 6,757,055 discloses an optical sensor that is coaxially disposed relative to the laser beam. Tani in Japan Patent Application No. 2001-79,679 discloses a CCD camera (element 15) coaxially disposed relative to a laser beam in a nozzle case. Kim et al. in U.S. Patent No. 6,555,780 discloses monitoring the size of the weld pool in laser welding.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey S Evans whose telephone number is (571)-272-1174. The examiner can normally be reached on Mon-Fri 6:30AM to 4:00 PM, alternate Fridays off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (571)-272-1171. The fax phone number for the organization where this application or proceeding is assigned is (703)-872-9306.

GSE

  
Geoffrey S. Evans  
Primary Examiner  
Group 1700